PIVOTALLY EXTENSIBLE DISPLAY DEVICE

BACKGROUND OF THE INVENTION

1. Technical Field of the Invention

This invention relates to visual information display screens for use with electronic devices such as portable computers, computer terminals, calculators, process control devices, or the like. More particularly, it relates to display screens including a plurality of screen members with an extensible member pivotally mounted so as to be rotatably adjustable about a pivot point with respect to a primary member.

2. Background Art

Notebook computers have a small viewing screen by design. That is, in order to achieve a small footprint for the notebook computer, the viewing screen is kept small. Increasing the size of the screen typically requires that the footprint be increased. This is not acceptable to a consumer, since a smaller footprint is preferred.

Several approaches to enlarging the viewing screen without increasing the size of the footprint have been proposed. These include (1) a collapsible screen which can be assembled in use and then disassembled and collapsed for compact storage; (2) a display module which is removable from a support module; (3) a secondary display module which is hinge attached for rotation into the plane of a primary display from a position substantially orthogonal thereto; and (4) a rotatable side-panel or monitor wing station mounted to a video display monitor. In these designs, however, the hinged mechanisms employed for rotating the secondary screens are limited in such a manner as to preclude positioning the secondary screen in any orientation (with three degrees of freedom) with respect to the primary screen. Such orientations are often beneficial or required for a user to view the screen in various ambient light conditions including light source location and intensity.

Consequently, it is an object of the invention to provide an improved enlargement of a viewing screen without increasing the footprint of the base device.

It is a further object of the invention to provide an improved viewing screen, rotatable within a plurality of degrees of freedom with respect to a base device.

It is a further object of the invention to provide a screen mounting apparatus for an enlarged viewing screen including a secondary screen positionable at any orientation with respect to a base device and within a plurality of degrees of freedom with respect to a primary screen without enlarging the footprint of the base device.

SUMMARY OF THE INVENTION

In accordance with the invention an interface apparatus comprises a base element, an interface element, and an attachment mechanism for attaching the interface element to the base element. The attachment mechanism is pivotable within a plurality of degrees of freedom.

Other features and advantages of this invention will become apparent from the following detailed description of the presently preferred embodiment of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates an opened pivotal display member in accordance with a first embodiment of the invention.

FIG. **2** illustrates multiple display members pivotally mounted in accordance with another embodiment the invention.

FIGS. **3** and **4** illustrate top and back views, respectively, of the closed pivotable display member of FIG. **1**.

FIG. **5** illustrates a pivotable mechanism for mounting a display member to a base device in accordance with a preferred embodiment of the invention.

FIG. **6** is a cut-away view of the pivotable mechanism of FIG. **5** illustrating the socket portion of a ball and socket mechanism of the pivotable attachment member of the preferred embodiment of the invention.

FIG. **7** is a view of the pivotable mechanism of FIG. **5** illustrating the ball and socket portions of the of the pivotable attachment member of the preferred embodiment of the invention.

FIG. **8** is a view of a ribbon wire for interconnecting a display member and base member (or another display member) so as to allow a plurality of degrees of freedom of motion between the members.

FIG. **9** illustrates a closed selectively extensible display member in accordance with another embodiment of the invention.

FIG. **10** illustrates the display member of the embodiment of FIG. **9** in the open position.

FIG. **11** is a cut away view of the display member of FIGS. **9** and **10** illustrating the selective extension support mechanism.

FIG. **12** illustrates a pivotally mounted side panel in accordance with a further embodiment of the invention.

FIGS. **13** through **16** illustrate various views of the pivotable mechanism of FIG. **12** in closed position for mounting a display member to another member.

FIGS. **17** and **18** illustrate a female spherical guide and socket surface for the pivotable mechanism of FIG. **12** in closed position.

FIG. **19** illustrates the socket attachment surface of FIG. **18**.

FIG. **20** illustrates a plurality of secondary display members rotatably mounted to a primary display device which is in turn rotatably mounted to a base member in accordance with another embodiment of the invention.

BEST MODE FOR CARRYING OUT THE INVENTION

In accordance with the invention, an extensible member is, in two of its embodiments, pivotally mounted so as to be rotatably adjustable about a pivot point with respect to a primary member. The primary member may be a base member or another display member. These members may be computer keyboards or displays, such as liquid crystal displays (LCDs), audio speakers, or the like such as are used in desk top or lap top computers and terminals. In a first embodiment, an extension display device is pivotally mounted to a primary display device. In a second embodiment, a primary display device is pivotally mounted to a keyboard base. In a third embodiment, the extension display device is pivotally mounted to a keyboard base, which is in turn pivotally or hinge mounted to a primary display device.

Further embodiments relate to pivotally and extensibly mounting various secondary devices in various combinations to a base or to other secondary devices so mounted.

FIG. **1** illustrates an opened pivotal display member, or LCD, **101** with rigid mounting wall **106** fixedly attached to a base member or keyboard **105**. Ribbon wire **109** interconnects display member **101** and base member **105** and, in this